

Trends in North Pacific Cod and Pollock Catch 1981-1998

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Introduction

Alaska pollock (*Theragra chalcogramma*) represents a large fraction of the global whitefish catch. Total North Pacific harvest has averaged between 5-6 million t since 1980, but has been declining over the past decade due to natural declines in abundance, and overfishing of some stocks. North American catch has been stable, varying annually only slightly from the 1981-1997 average of 1.3 million t. In Asia, on the other hand, catch decreased significantly over the same time period, decreasing from a peak of 5 million t in 1981 to 2.2 million t in 1994. Part of the decline was due to overfishing, principally in Japan and Korea, and some in Russia, including the Peanut Hole Fishery. A partial reason for the very low catches observed in 1994 was the collapse of the Russian fishing industry, and their inability to fully exploit pollock and other fish in the Russian EEZ. However, harvesting capacity has increased in Russia, and catch has been increasing in recent years. In other areas of Asia, catches appear to remain at relatively low levels, and where data are available, there do not appear to be any prospects for near term increases in stocks or harvest.

The two largest pollock stocks are the eastern Bering Sea in the U.S. EEZ, and the Sea of Okhotsk in the Russian EEZ. Since the advent of the U.S. EEZ in 1977 the

annual average eastern Bering Sea pollock catch has been 1.2 million t and has ranged from 0.9 million in 1987 to nearly 1.6 million t in 1991. Stock biomass has ranged from a low of 4-5 million to highs of 12-14 million t. Pollock harvests in the Sea of Okhotsk are estimated to have been 1.8 million t. in 1997, down from 2.0 million t. in 1996. Pollock stock abundance is believed to be decreasing in the Sea of Okhotsk from natural decline and overfishing. Russian scientists estimate the stock to be in the range of 2-3 million t., with a very large 1995 year class due to enter the exploitable population in 2000. Russian fishery authorities are working to establish increased mesh size regulations and other measures to protect this year class and allow as many as possible to recruit to the spawning population.

High-seas fisheries for pollock in the Bering Sea "donut hole" and Okhotsk Sea "peanut hole" were key factors for the increase in pollock production from the mid-1980s to early 1990s (Fig. 1). Foreign vessels began fishing in the mid-1980's in the international zone of the Bering Sea (commonly referred to as the "Donut Hole"). The Donut Hole is entirely contained in the deep water of the Aleutian Basin and is distinct from the customary areas of pollock fisheries, namely the continental shelves and slopes. Japanese scientists began reporting the presence of large quantities of pollock in the Aleutian

Basin in the mid-to-late 1970's, but large-scale fisheries did not occur until the mid-1980's. In 1984, the donut hole catch was only 181 thousand t (Fig. 1). The catch grew rapidly and by 1987 the high seas catch exceeded the pollock catch within the U.S. Bering Sea EEZ. The extra-EEZ catch peaked in 1989 at 1.45 million t and has declined sharply since then. By 1991, the donut hole catch was 80% less than the peak catch, and data for 1992 and 1993 indicate very low catches. A fishing moratorium was enacted in 1993 and only trace amounts of pollock have been harvested from the Aleutian Basin by resource assessment fisheries.

North American Pollock

The principal fisheries in North America are off Alaska, in the eastern Bering Sea and in the western Gulf of Alaska. Minor fisheries occur in the eastern Gulf of Alaska and off Canada.

Gulf of Alaska

Current stock assessments on pollock within the Gulf of Alaska estimate the stock size to be around 1 million tons, down from nearly 3 million during the early 1980s (Figure 4). A strong 1994 year class has appeared so that the prognosis for the near future is stable with about 120 thousand tons available for harvests.

Eastern Bering Sea

The eastern Bering Sea pollock fishery is the largest fishery in North America, and has averaged a harvest of 1.2 million t since the early 1980s.

The stock structure of Bering Sea pollock is not well defined. In the U.S. portion of the Bering Sea pollock are considered to form three stocks for management purposes. These are: eastern Bering Sea which consists of pollock occurring on the eastern Bering Sea shelf from Unimak Pass to the U.S.-Russia Convention line; Aleutian Islands

Region which encompasses the Aleutian Islands shelf region from 170°W to the U.S.-Russia Convention line; and Central Bering Sea -Bogoslof Island pollock, which are thought to be a mixture of pollock that migrate from the U.S. and Russian shelves to the Aleutian Basin around the time of maturity. In the Russian EEZ, pollock are considered to form two stocks, a western Bering Sea centered in the Gulf of Olyutorski, and a northern stock located along the Navarin shelf from 171°E to the U.S.-Russia Convention line. The northern stock is believed to be a mixture of eastern and western Bering Sea pollock with the former predominant. The areas of interest for the pollock fisheries are shown in Figure 2 and the catch by region in 1998 is shown in Figure 3.

While catch has been stable biomass has fluctuated greatly in response to strong variation in recruitment. In the late 1970s and early 1980s three strong year classes occurred which increased the population to very high levels in the mid-1980s (Figure 5). In the late 1980s to early 1990s only one strong year-class occurred, 1989 (Figure 6), and the population declined to lower levels of abundance. In 1997 and 1998 trawl surveys and hydroacoustic-midwater trawl surveys of the eastern Bering Sea found that the overall biomass of eastern Bering Sea pollock decreased slightly from 1996, as expected with an above-average indication for the strength of the 1996 year-class. Mean weight-at-age of pollock in the fishery has changed over time indicating a fair amount of inter-annual variability and a general increase (Figure 7). The historical and forecast level of spawning stock for eastern Bering Sea pollock shows that the stock is currently close to a target level needed to attain MSY and that it is declining from historic high levels during the 1980s and 1990s (Figure 8).

Yield estimates, recommendations, and actual quotas (TACs) for eastern Bering Sea pollock are shown in Figure 9. Note that the recommendations and actual quotas have

always been considerably lower than MSY estimates. This demonstrates that the precautionary principle has been in effect in this region since regional management under the US MFCMA was enacted in 1977.

Aleutian Islands Region

Aleutian Islands pollock, which appear to be a geographic extension of eastern Bering Sea pollock are stable or increasing. This stock is currently surveyed only by bottom trawl gear and then only every 3 years. As such, information about this stock is poor and therefore harvests unlikely to increase. Compounded with poor information on stock abundance in this region is the proximity to endangered species of Steller sea lion habitat. A 1997 survey indicates that biomass has increased from a 1994 survey. The pollock size frequency obtained in the survey indicates that the 1989 year-class is the dominant age group. Recent quotas and catches have been around 23 thousand tons.

Adjacent to the Aleutian Islands is the Bogoslov Island area that is the primary spawning area of the Aleutian Basin/Donut Hole "stock". The status of the Aleutian Basin or "Donut Hole" region is under annual review of the international organization following the Central Bering Sea Convention. In 1998 this represented two meetings where experimental fishing and survey plans were presented. The most recent report from trial fishing in this region experienced extremely poor catch rates. Cooperative surveys among the parties are being planned for the near future. The U.S. delegation presented results from the Bogoslov Island area survey. This survey is considered an index of this Basin stock and is currently estimated at about 500 thousand tons (Figure 10). The concurrence of the Scientific and Statistical committee of the Central Bering Sea meeting was that the recruitment patterns to the Basin region has changed and that in the short-term, there is unlikely to be any directed fishery in this region.

Asian Pollock

Pollock fisheries occur in the Japan Sea within the EEZs of Japan, Korea, and Russia, on the Pacific side of Hokkaido. Stocks in these waters are currently small, primarily due to overfishing. Recent official catch data is scant. The greatest amount of catch is by Japan where the catch quota was established as 258 thousand t in 1997. South Korea has had very small harvests in its EEZ in recent years, and the catch from North Korea is unknown, although it is reported to have been closed since 1989 due to low abundance. Russia also harvests relatively small amounts of pollock from the Japan Sea and South Kurile Islands. The expected 1999 harvest from these and other minor stocks in Russian waters is estimated to be less than 300 thousand t.

The primary harvest areas for pollock in Asia are in the Sea of Okhotsk and northwestern Bering Sea. The Okhotsk Sea is the primary Asian harvest area, and contains two main stocks, the northern Okhotsk, and west Kamchatka stocks. The preliminary estimate of the 1997 pollock catch in west Kamchatka is 1.18 million t, about equal to 1996. In the Northern Okhotsk the catch decreased slightly between 1996 and 1997, dropping to 581 thousand t from 756 thousand t. For 1999 Russian biologists are recommending further reductions which would decrease the west Kamchatka catch to less than 800 thousand t, and the northern Okhotsk to about 400 thousand t. The 1999 Russian pollock quotas are not yet finalized, and it is possible that the final quotas may be different from those recommended by scientists.

Scientists are concerned that the over-harvest in 1995-1996 reduced the amount of mature pollock available in 1997 leading the fishery to harvest small pollock. The problem of small fish may have been also caused by regulations which prohibit trawling in the coastal spawning areas where adult pollock congregate, forcing trawl

vessels to fish immature pollock in offshore areas.

The 1997 fishery was also reported to be effected by large area fishery closures of areas with high bycatch of herring and under-sized pollock. Adult pollock abundance in Okhotsk Sea is expected to continue to decline in 1998. Russian data indicates the 1995 year-class is a large year-class and 1992-1993 are near average. The oldest of these year-classes are reaching maturity, and the 1995 year-class not until 2000.

The western-northern Bering Sea is the second largest producer in the Russian EEZ. The catch of western Bering Sea stock used to average about 250 thousand t, but in recent years has decreased to 50-70 thousand t due to decrease in stock abundance, and concentration of fishing effort in more productive areas such as the Okhotsk and northern Bering Sea. The recommended catch quota for the western Bering Sea in 1998 is up, increasing to 150 thousand t.

The northern Bering Sea has the second largest quota in the Russian EEZ, with an estimated catch in 1998 quota of 710 thousand t. Pollock in this area originate from the western Bering Sea and eastern Bering Sea stocks, and little to no spawning is observed in the area. Russian vessels have fished the area since the early 1970s, and the catch has average near 500 thousand t, with a peak of 900 thousand t in 1981. Recent commercial catch-rate information in the Navarin area shows a decline since 1995 (Figure 11).

This fishery is problematic for several factors: it is believed that a significant portion of the harvest are juvenile pollock that will recruit to the spawning population in the U.S. EEZ; there is little dialogue between the US and Russia in developing a coherent management plan; and there are questions on the level of Russian fisheries monitoring in the area. The magnitude of the harvest of small pollock in the Russian

northern Bering Sea is not fully known, but from reports of vessel masters fishing the area, it may be significant.

Russian scientists had been concerned that the percentage of under-sized pollock would increase in the 1998 west Kamchatka fishery. However, they believe new regulations may decrease the anticipated problems. In 1998, for the first time, trawlers will be able to fish in selected coastal spawning areas, which will allow harvest of large pollock. Secondly, mesh size and minimum retention size increases have been proposed which should further reduce the harvest of juvenile fish. The mesh size and minimum retention size increases also apply to the Bering Sea, so the catch of juvenile pollock should also decrease in this area as well.

Pollock Outlook-Summary

The estimated projected harvest of pollock forecasts by area is shown in Figure 12. All areas show a decrease in production though the forecast estimates (and estimates of harvests in 1997 and 1998) are poorly known in some areas.

Within the US EEZ the largest amount of uncertainty regarding pollock production involves the impact a newly placed allocation law called the “[American Fisheries Act](#)¹” will affect production. Also, ruling on the endangered species to reverse the declining abundance of Steller sea lions is likely to inhibit the prosecution of the Alaska fisheries in the Bering Sea and in the Gulf of Alaska as early as January 1999. Measures to protect these sea lions include creating larger trawl exclusion zones and also varying the length and timing of pollock fishing seasons.

¹ <http://www.fakr.noaa.gov/afa.pdf>

Pacific cod

Pacific cod are distributed in a similar manner as pollock, occurring from the Pacific northwest in North America north into the Bering Sea and southward along the Asian coast as far south as Korea. The greatest abundance occurs in the Bering Sea where the current abundance is about 1.2 million t (Figure 13).

North American Pacific cod

Similar to pollock the centers of abundance and harvests are in the western-central Gulf of Alaska and the eastern Bering Sea. In the Bering Sea abundance increased in the early 1980s and catch also rose. Since 1987 catch has fluctuated around 194 thousand t., which is a harvest of about 13% of the exploitable stock. Catches could be higher, but are limited by by-catch restrictions, and a total annual groundfish harvest limit of 2 million t. Unlike pollock, Pacific cod are considered more mobile in their movements, especially between the Gulf of Alaska and the eastern Bering Sea.

Pacific cod catches are expected to remain at present levels since an above average 1992 year-class has recently entered the exploitable population, and another strong year-class (1996) is expected to continue the population at high levels in the future. The projected 1998 catch is about 190 thousand t and the 1999 preliminary harvest recommendation is 180 thousand t.

Pacific cod is not as abundant in the Gulf of Alaska where catch has averaged 66 thousand t. since 1990. The projected 1998 catch is 66 thousand t., and the 1998 preliminary recommendation is projected to be about 55,000 t.

Asian Pacific Cod

The data for cod from Asian waters is scant, primarily because abundance appears low relative to North America. The highest abundance in Asia appears to be in the Russian Navarin area of the Northern Bering

Sea adjacent to the U.S. EEZ where the catch has averaged 44 thousand t since 1983. These cod are likely an extension of the eastern Bering Sea stock, similar to the situation with pollock.

The catch of cod is much lower in other areas of Russia and off of Japan. The average catch in these areas has been about 50 thousand t.

Cod catch has been low relative to TAC in Russia, because areas of high cod abundance is not readily trawlable due to closures to protect crab. Also, often cod are not densely concentrated enough for trawling. A Russian longline fleet is developing which targets on Pacific cod, and taking an increasing portion of the catch. The overall forecast 1998 Asian cod harvest is estimated to be about 170 thousand t.

Estimated catches of Pacific cod in the non-U.S. areas of the North Pacific in thousands of tons
(Source: TINRO).

Year	Total Catch	Bering Sea	Okhotsk Sea	Japan Sea	Other regions
1985	188.4	122.9	56.3	1.0	8.2
1986	168.4	117.7	20.8	5.4	24.6
1987	175.3	99.9	15.7	1.5	58.2
1988	148.1	70.3	22.6	3.9	51.3
1989	140.4	62.0	15.8	11.4	51.2
1990	121.4	89.2	25.2	3.9	3.7
1991	106.5	61.8	33.0	1.9	9.9
1992	154.3	110.0	35.4	2.2	6.7
1993	95.8	61.7	27.5	1.7	5.0
1994	81.5	59.8	15.0	0.7	6.0
1995	100.7	76.1	19.6	2.2	2.9
1996	93.7	74.6	15.0	2.1	2.0

1996 TAC= 149,000 t

1997TAC = 190,000 t

1998 TAC=176,000 t

World Pollock Catch 1981-1998

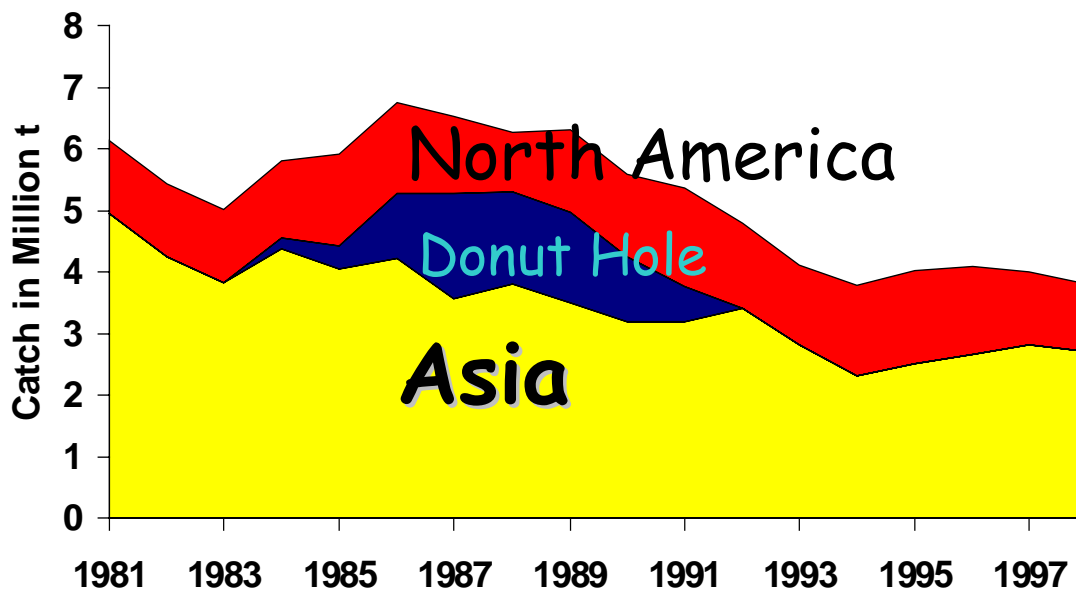


Figure 1. World Alaska pollock fishery catch by major area, 1981-1998.

Pollock Fishery Areas

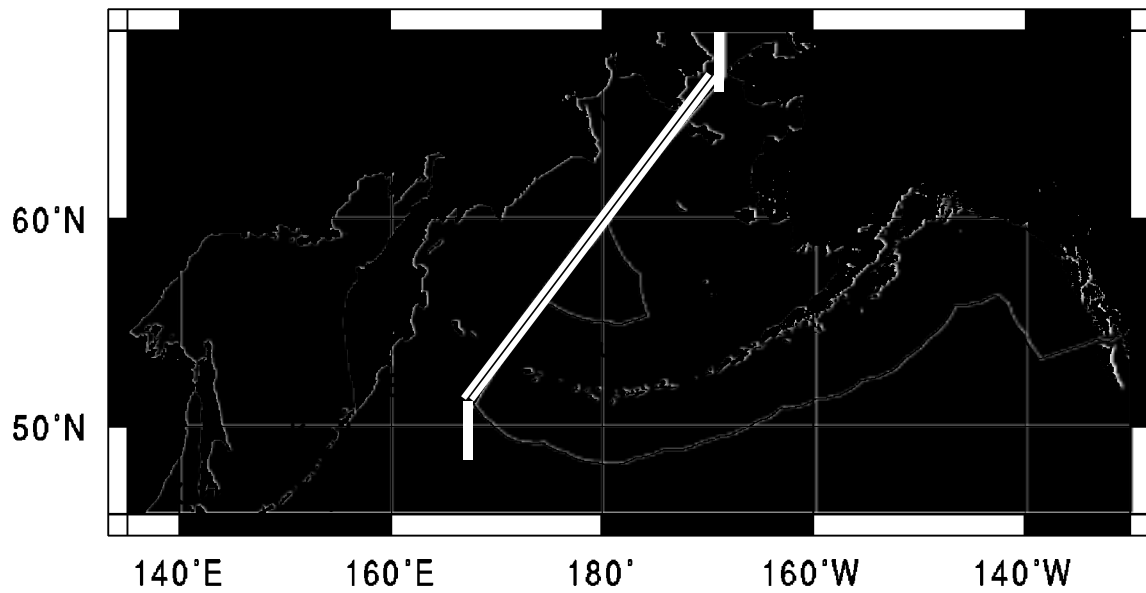


Figure 2. Main pollock fishery areas.

1998 Estimated Pollock catch (3.675 million tons)

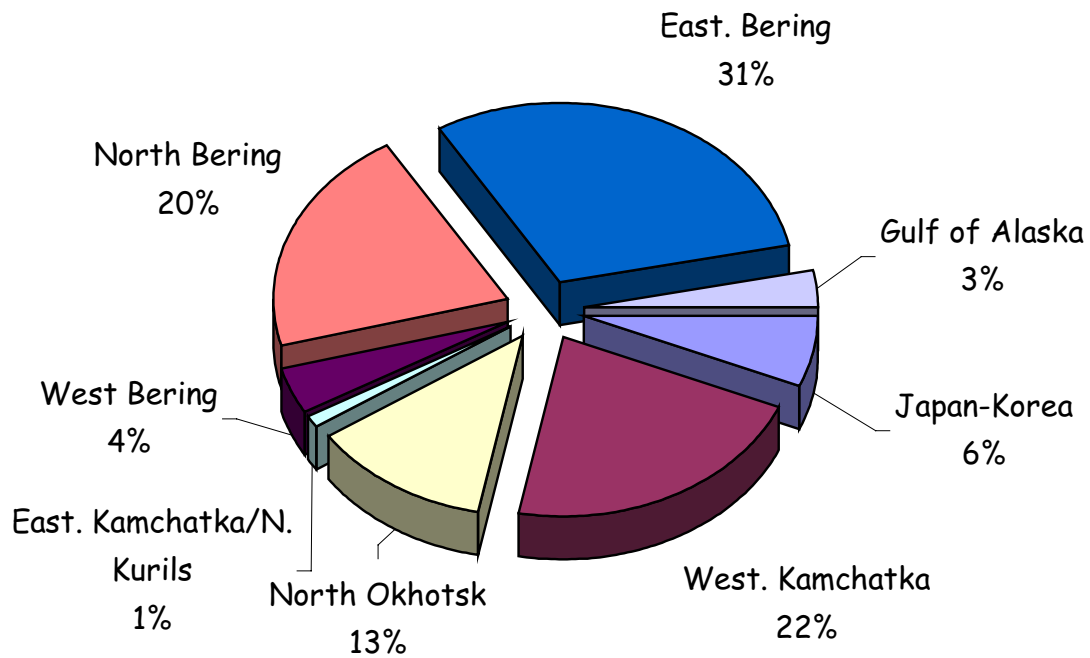


Figure 3. Breakdown of estimated pollock catch by fishery area for 1998.

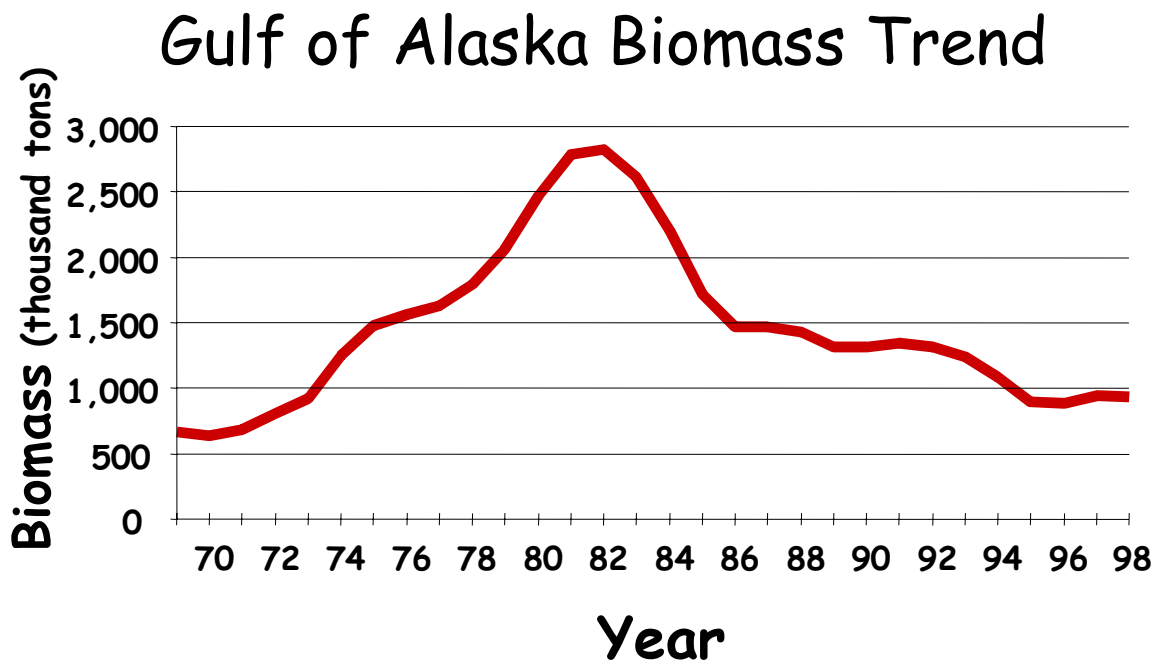


Figure 4. Gulf of Alaska historical stock trend (Source: NMFS AFSC stock assessment, 1998).

Eastern Bering Sea

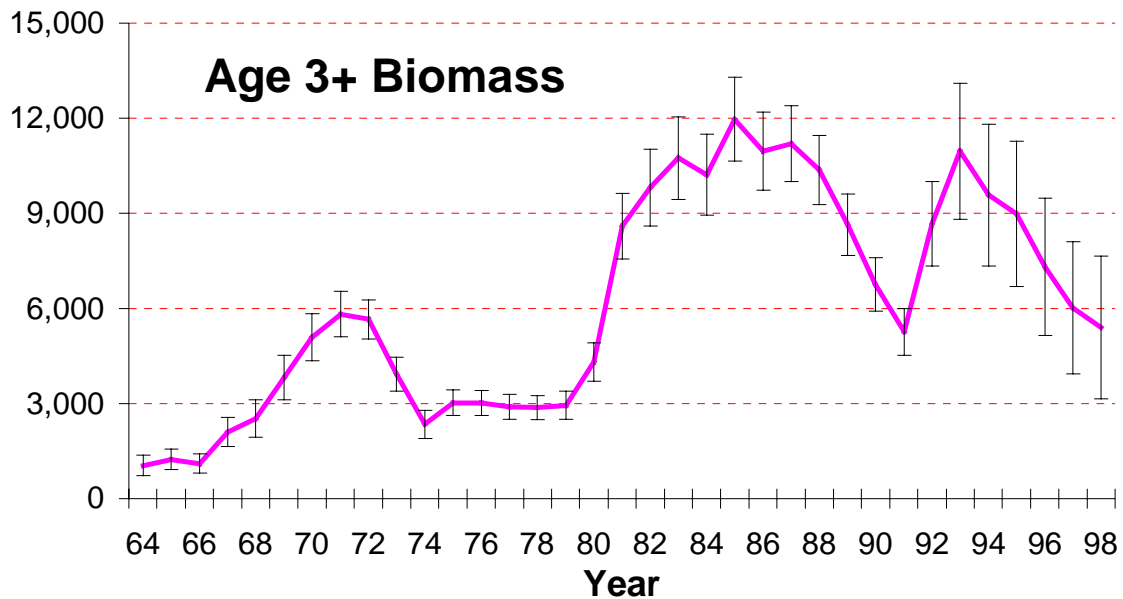


Figure 5. Biomass trend for eastern Bering Sea pollock (Source: NMFS AFSC Stock assessment, 1998).

Year class history

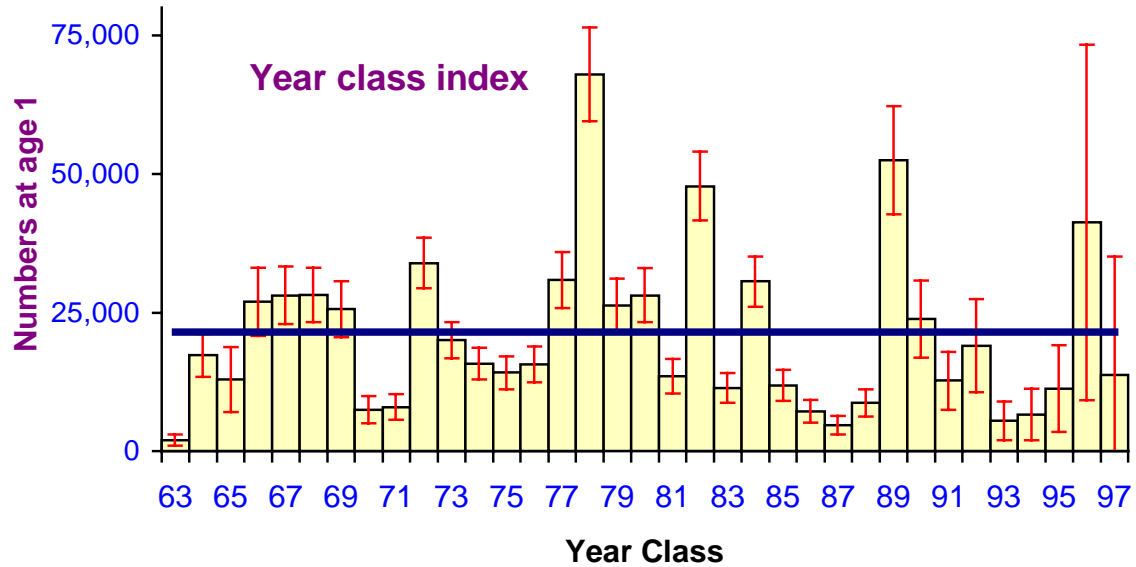


Figure 6. Estimate of year-class strengths for eastern Bering Sea Pollock. (Source: NMFS AFSC Stock assessment, 1998).

Biological Changes

- **Weight at age trend**

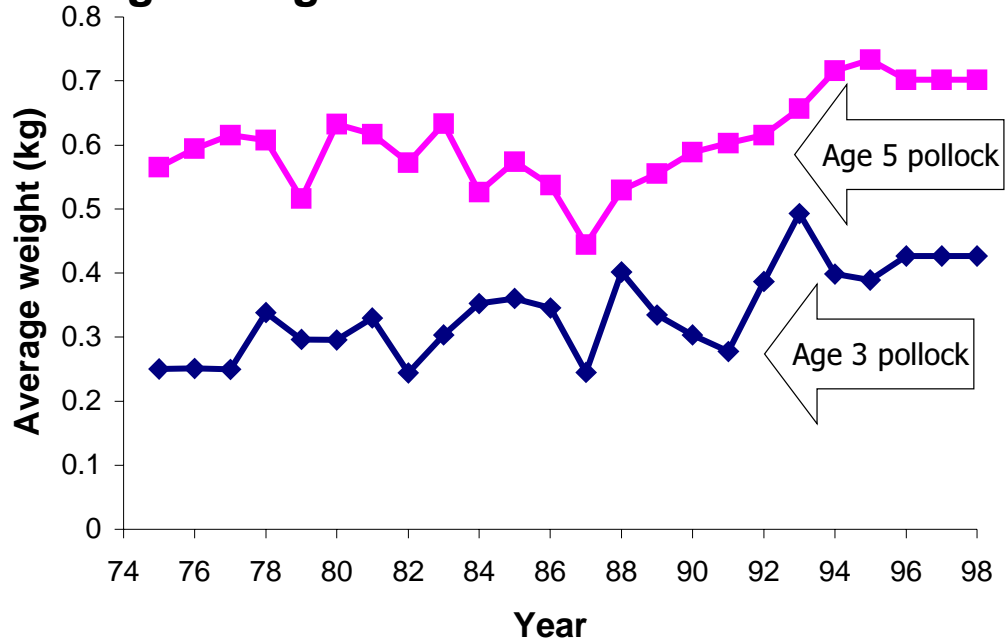


Figure 7. Changes in the mean weight-at-age for eastern Bering Sea Pollock. (Source: NMFS AFSC Stock assessment, 1998).

E. Bering Stock size projections...

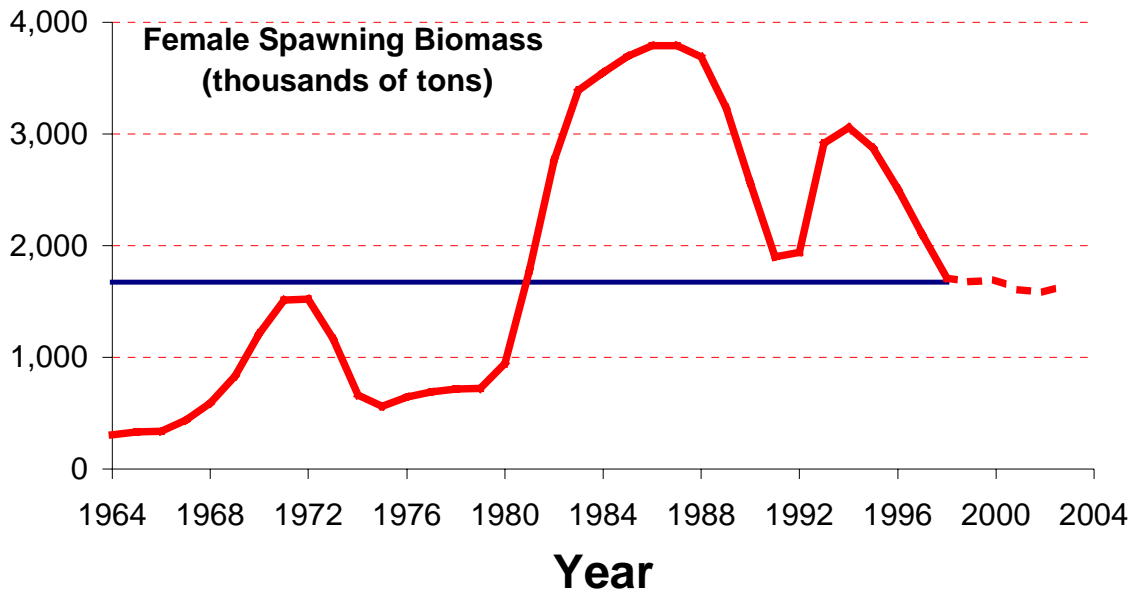


Figure 8. Historical and future projections of spawning stock size.

Eastern Bering Sea Pollock Yield Estimates

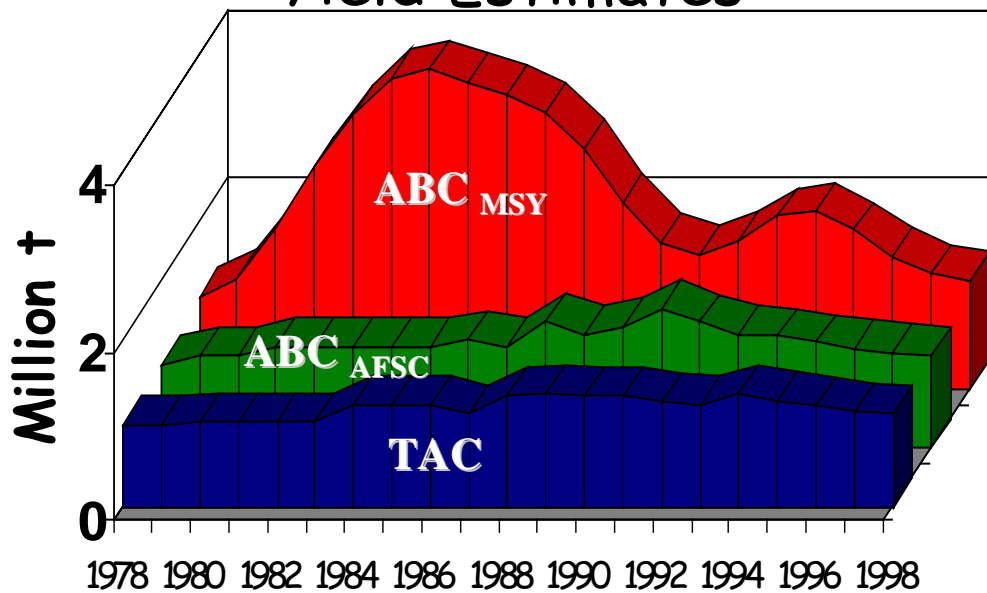


Figure 9. Yield recommendations (ABC) and actual quotas that have been implemented (TAC), 1978-1998.

Bogoslov survey estimates

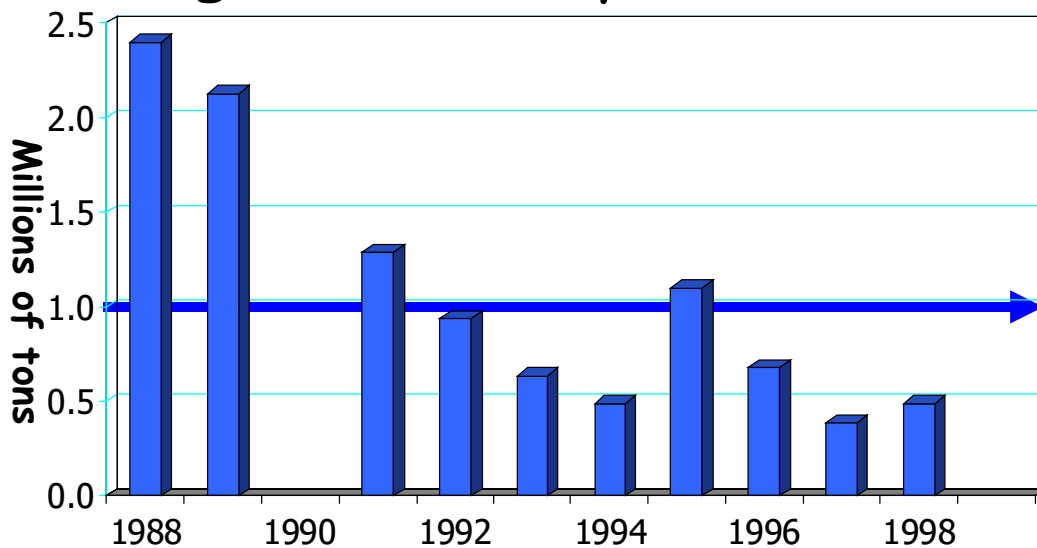


Figure 10. Survey estimates of pollock abundance from the Bogoslov Island region. The horizontal line represents the minimum level of stock size considered for allowing an international fishery in the Donut Hole region to occur.

Catch Rates in Navarin Area

Tons per day, June-August

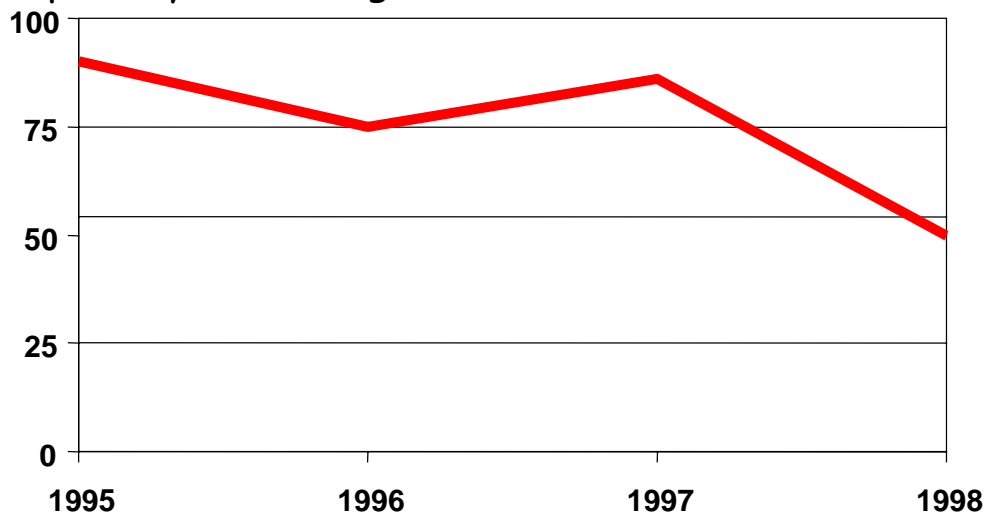


Figure 11. Catch rates estimated from commercial vessels in the Navarin area (northern Bering Sea) 1995-1998.

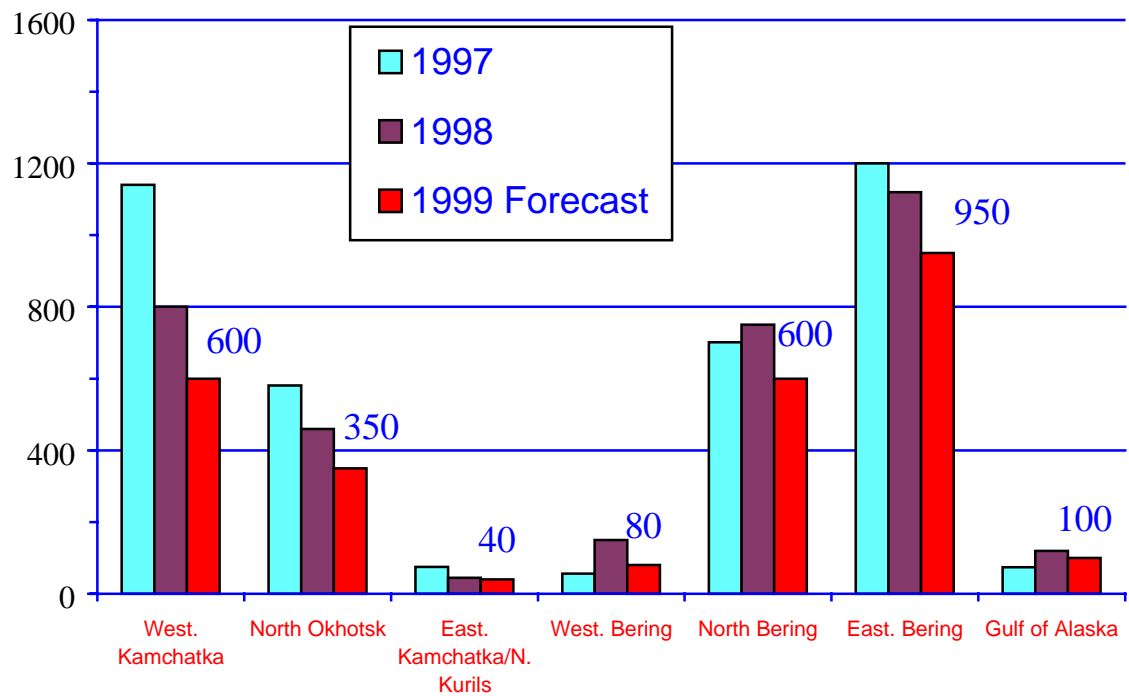


Figure 12. Alaska pollock catch estimates by area. Totals by year are 1997: 3 830 thousand tons, 1998: 3 450 thousand tons, and projection for 1999: 2 720 thousand tons.

Pacific Cod Abundance trends

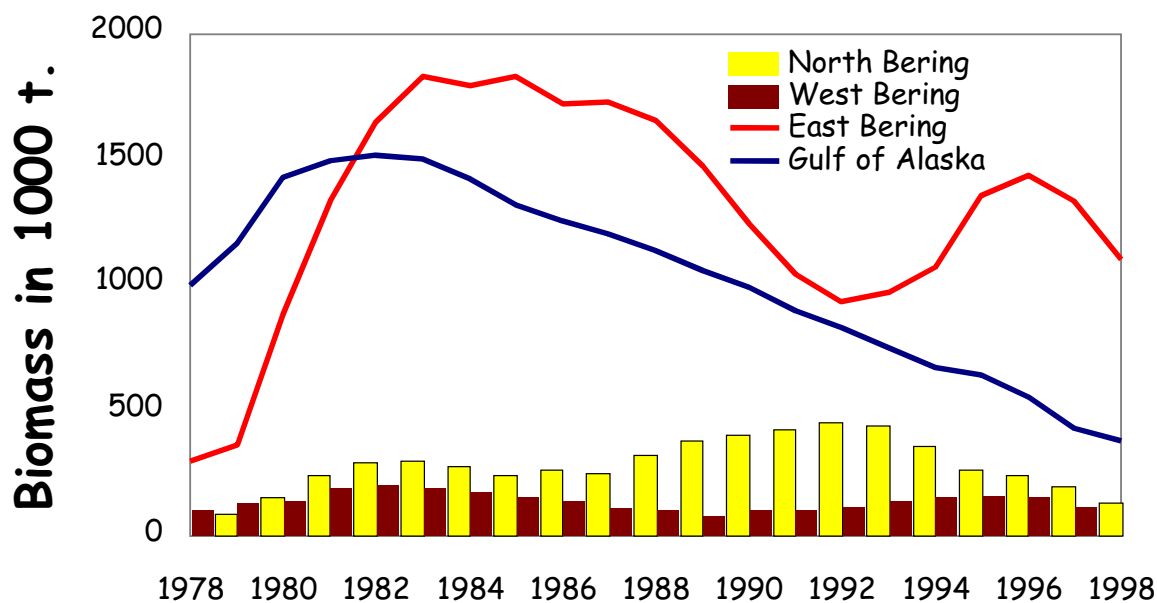


Figure 13. Pacific cod abundance trends by area.

1998 Pacific Cod Catch by area

Total ~ 500 thousand tons

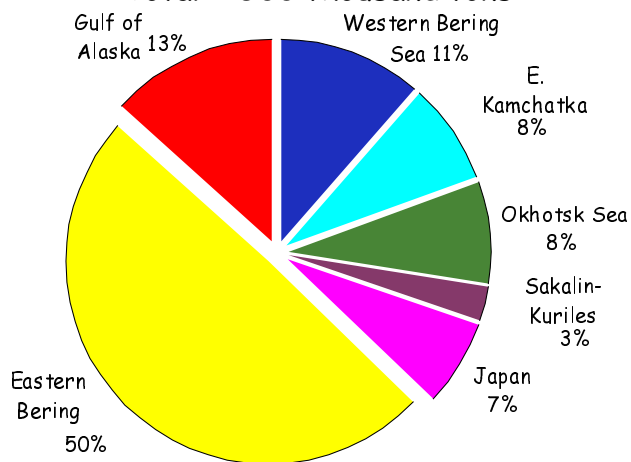


Figure 14. Projected Pacific cod catches by area (1998).